Pest Alert

United States
Department of Agriculture

Forest Service

Northeastern Area
NA-PR-01-02

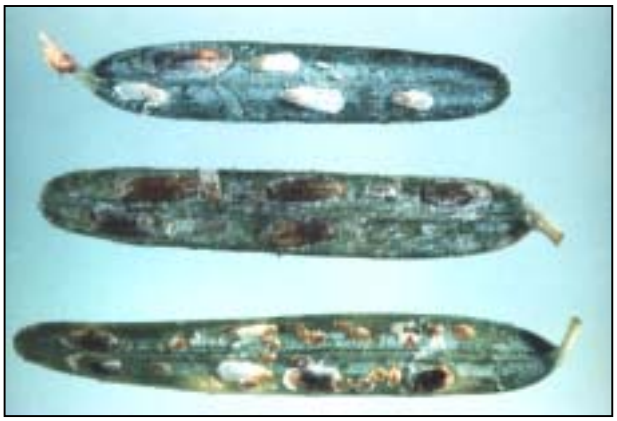
Elongate Hemlock Scale

The elongate hemlock scale, *Fiorinia externa* Ferris, native to Japan, is a pest of eastern hemlock, *Tsuga canadensis*, and Carolina hemlock, *T. caroliniana*, in the Eastern United States. It has been found in the District of Columbia and in nine states from Virginia to southern New England and west to Ohio. *F. externa* attacks the lower surface of the hemlock needle, where it removes fluids from the mesophyll cells through piercing and sucking mouthparts. Elongate hemlock scale sometimes occurs with two other exotic pests — a circular hemlock scale, *Nuculaspis tsugae* (Marlatt), and the hemlock woolly adelgid, *Adelges tsugae* Annand. Mixed infestations of scales and adelgids can greatly hasten hemlock decline.

Hosts: Elongate hemlock scale is known to develop and reproduce on 43 species, representing 7 genera of native and exotic conifers, including 14 species that are native to the United States. Spruce and fir tend to be even more susceptible than hemlock, although it has not yet spread into the natural ranges of these other native conifers.

Description: Adult females are soft-bodied, legless, wingless, and are enclosed in an elongate, parallel-sided cover that is light yellow to brown, translucent, and about 2mm long. The male cover is elongate, white, and about 1.5mm long. Adult males are light brown, about 1.5mm long, have legs and wings, but are feeble-flying insects. Crawlers are legged first-stage nymphs that hatch from translucent eggs within the female cover. Crawlers are soft bodied, lemon-colored, and about 0.1mm long. Second-stage nymphs are enclosed in an oval, amber-colored cover, and are soft bodied, sedentary, and vary in size from 0.1mm to 1.0mm.

Life History: The elongate hemlock scale completes two generations each year in the Southern and Mid-Atlantic States, but usually only one in the Northeast. Its life stages are broadly overlapping everywhere, so crawlers can be found throughout the spring and summer. Crawlers are the only stage capable of dispersing and establishing new infestations. Dispersal between trees is primarily by wind and birds. Females have three stages of development after the egg, while males have five. Within a day or two after hatching, crawlers of both sexes settle beneath the thin waxy cuticle on the lower surface of the youngest hemlock needles and begin to feed. The first-stage nymph for both sexes secretes a cover around itself as it grows. It then molts into a second feeding stage, continues to grow and add to its cover. The second-stage female then molts into the adult feeding stage. The second-stage male molts into a non-feeding prepupa and spins a cocoon, where it pupates before it emerges as an adult. The adult male mates with the female and dies soon thereafter without feeding. The adult female lays about 20 eggs within her cover. When crawlers hatch, they exit through a small opening at the posterior end of the cover. Elongate hemlock scale usually overwinters, either as an egg or as an inseminated adult female.



Nymphs and adults of elongate hemlock scale, *Fiorinia externa*, on the lower surface of hemlock needles.

Nymphs and adults of circular hemlock scale, *Nuculaspis tsugae*, on the lower surface of hemlock needles.

Damage to Hemlock: Scale populations build slowly on healthy trees, but much more quickly on stressed ones. Feeding by elongate hemlock scale causes foliage to turn yellow and drop prematurely. Dieback of major limbs, which progresses from the bottom of the tree upwards, usually occurs after scale density reaches about 10 individuals per needle. Trees often die within the next 10 years, but some survive longer in a severely weakened condition with only a sparse amount of foliage at the very top of the crown. These weakened trees are unsightly and have little chance for recovery. They often fall victim to secondary pests, such as hemlock borer and *Armillaria* root diease, and are readily broken and thrown by wind.

Damage to hemlock caused by elongate hemlock scale.

Control: Outbreaks of elongate hemlock scale often intensify following infestations of hemlock woolly adelgid, drought, or other stresses that have weakened the trees. Therefore, maintaining trees in healthy condition will discourage the buildup of scale populations. For example, hemlock have shallow roots and are consequently susceptible to drought, so ornamental trees should be watered during dry periods. However, applications of nitrogen fertilizer and broad-spectrum insecticides can exacerbate the pest problem. Nitrogen enhances the survival, development rate, and fecundity of *F. externa*, which results in higher scale densities on fertilized trees than on untreated ones. Also, inadequate pesticide application can cause resurgence in scale populations by eliminating natural enemies. The aphelinid parasitoid, *Aspidiotiphagus citrinus* Craw, consistently kills more than 90 percent of each generation of elongate hemlock scale in Japan. In the northeastern United States rates of parasitization are inconsistent (5-96 percent) because the life cycles of *A. citrinus* and *F. externa* are not synchronized. Two coccinellid beetles, the twice-stabbed ladybird beetle, *Chilocorus stigma* (Say), and *Microweisea misella* (LeConte), also attack *F. externa* in North America, but not frequently enough to control scale populations. Nevertheless, when broad spectrum or poorly applied pesticides eliminate these enemies, scale populations often rebound dramatically.

Adult of the aphelinid parasitoid, *Aspidiotiphagus citrinus.*

Adult of the twice-stabbed ladybird beetle, *Chilocorus stigma.*

Control of elongate hemlock scale is not possible in forests, but in ornamental plantings it can be controlled by thoroughly drenching trees with horticultural oil during early spring, when trees are dormant, and again, if needed, during the growing season. In forests, declining hemlocks should be salvaged to prevent buildup and spread of scale populations.

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